

1. (Currently Amended) A laser [for generating ultra short optical pulses], comprising:
a cavity which repeatedly passes light energy along a cavity axis;
a length of multi-mode optical fiber having a cladding and doped with a gain medium and positioned along said cavity axis;
a pump coupled to said cladding for exciting said gain medium;
[a mode locking mechanism positioned on said cavity axis; and]
an optical guide positioned on said cavity axis which confines the light amplified by said multi-mode optical fiber to preferentially the fundamental mode of said multi-mode optical fiber.
2. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said mode locking mechanism comprises a passive mode locking element.
3. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 2 wherein said passive mode locking element comprises a saturable absorber.
4. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 3 wherein said saturable absorber comprises InGaAsP.
5. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 3 additionally comprising a power limiter for protecting said saturable absorber.
6. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 5 wherein said power limiter comprises a two photon absorber.
7. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises a single-mode mode-filter fiber on said cavity axis.
8. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 7 wherein said single-mode mode-filter fiber is fusion spliced onto one end of said multi-mode optical fiber.
9. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 8 wherein said single-mode mode-filter fiber is tapered at said fusion splice.
10. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 8 wherein both said single-mode mode-filter fiber and said multi-mode fiber are tapered at said fusion splice.

13. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said pump is coupled to said multi-mode fiber along said cavity axis.

11. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 13 additionally comprising an optical coupler for coupling said pump to said multi-mode fiber.

12. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 13 additionally comprising a v-groove on said multi-mode optical fiber for coupling said pump to said multi-mode fiber.

13. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 additionally comprising a polarization beam splitter for outputting said ultra-short optical pulses from said laser.

14. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said cavity comprises a pair of reflectors at its opposite ends.

15. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 17 wherein one of said pair of reflectors is partially reflecting and provides the output for said cavity.

16. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 17 wherein said mode locking mechanism comprises a saturable absorber, and wherein one of said reflectors is formed on a surface of said saturable absorber.

17. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 19 wherein said mode locking mechanism additionally comprises a power limiter for protecting said saturable absorber, and wherein said saturable absorber is formed on a surface of said power limiter opposite said one of said reflectors.

18. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 20 wherein said power limiter comprises a two-photon absorber.

19. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 additionally comprising a linear phase drift compensator on said cavity axis.

20. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 22 wherein said linear phase drift compensator comprises a Faraday rotator.

21. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 23 wherein said linear phase drift compensator comprises a pair of Faraday rotators.

22. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 22 additionally comprising a linear polarization transformer on said cavity axis.

23. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 25 wherein said linear polarization transformer comprises a wave plate.

24. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said ultra-short optical pulses preferentially in the fundamental mode of said multi-mode optical fiber have a pulse width below 500 psec.

25. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 additionally comprising an environmental stabilizer on said cavity axis to assure that said cavity remains environmentally stable.

26. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 31 wherein said environmental stabilizer comprises a Faraday rotator.

27. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 32 wherein said environmental stabilizer comprises a pair of Faraday rotators.

28. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises an optical fiber doped with an amplifying medium to provide gain guiding.

29. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 34 wherein said amplifying medium is concentrated centrally within a fraction of the core diameter of said optical fiber.

30. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises a single-mode optical fiber on said cavity axis.

31. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises a mode-filter on said cavity axis.

32. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 37 wherein said mode filter excites the fundamental mode of said multi-mode fiber.

33. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 38 wherein said mode filter excites the fundamental mode of said multi-mode fiber with an efficiency of at least 90%.

34. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said cavity additionally comprises a positive dispersion element.

35. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 40 wherein said positive dispersion element comprises a length of single-mode positive dispersion fiber positioned along said cavity axis.

36. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 41 additionally comprising an output coupler for limiting the light energy at said single-mode positive dispersion fiber to less than 10% of the peak power in said cavity.

37. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 42 additionally comprising a frequency converter for compressing pulses generated by said cavity.

38. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 43 wherein said frequency converter comprises a frequency doubler.

39. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 44 wherein said frequency doubler comprises chirped periodically poled LiNbO₃.

40. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said multi-mode fiber includes a core, and wherein said gain medium in said multi-mode optical fiber is concentrated centrally within the core of said multi-mode fiber.

41. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said cavity additionally comprises a fiber grating written onto said multi-mode fiber, said grating primarily reflecting the fundamental mode of said multi-mode fiber.

51. (Canceled)

52. (Canceled)

53. (Canceled)

54. (Canceled)

55. (Currently Amended) A method of generating ultra-short optical pulses, comprising: circulating light energy within a laser cavity;

Appl. No. : 09/785,944
Filed : February 16, 2001

amplifying said light energy within said laser cavity in a bent multi-mode fiber; and
confining said light energy within said laser cavity substantially to the fundamental mode of
said multi-mode fiber.

56. (Original) A method of generating ultra-short optical pulses as defined in Claim 55
additionally comprising mode locking said light energy.

57. (Original) A method of generating ultra-short optical pulses as defined in Claim 55
wherein said confining comprises mode filtering said light energy.

Please charge any additional fees, including any fees for additional extension of time, or
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Respectfully submitted,

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Dated: May 30, 2006

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